SECTION 7 GUIDELINES -Snake River Basin Office
Snake River Mollusks

I. BACKGROUND ON ALL LISTED SNAKE RIVER MOLLUSKS

Legal Status

Idaho's five federally listed snail species, Idaho springsnail (*Pyrgulopsis idahoensis*) (endangered), Utah valvata snail (*Valvata utahensis*)(endangered), Snake River physa snail (*Physa natricina*)(endangered), Bliss Rapids snail (*Taylorconcha serpenticola*)(threatened), and Banbury Springs lanx *(Lanx* ssp.*)* (endangered) are part of the native mollusc fauna of the Snake River characteristic of cold, flowing water in lotic habitats. These species were listed on December 14, 1992 (57 FR 59244). Many of the 42 known species of molluscs in the middle Snake River are widely distributed and are somewhat tolerant of pollution; the 5 listed snails are primarily limited to the Snake River basin below American Falls Dam, and are generally intolerant of pollution (Figure 1- SRM).

Based on the fossil record, 4 of the listed snails are endemic to the Pliocene Lake Idaho region and its Pleistocene successors (Frest 1991a). In general, the fossil record shows a larger historic distribution than current with historic populations considered to be continuous throughout their range. An exception is the Banbury Springs lanx, an obligate spring species with no known fossil records; according to Frest (1991a), each geographically isolated spring could be considered a different population.

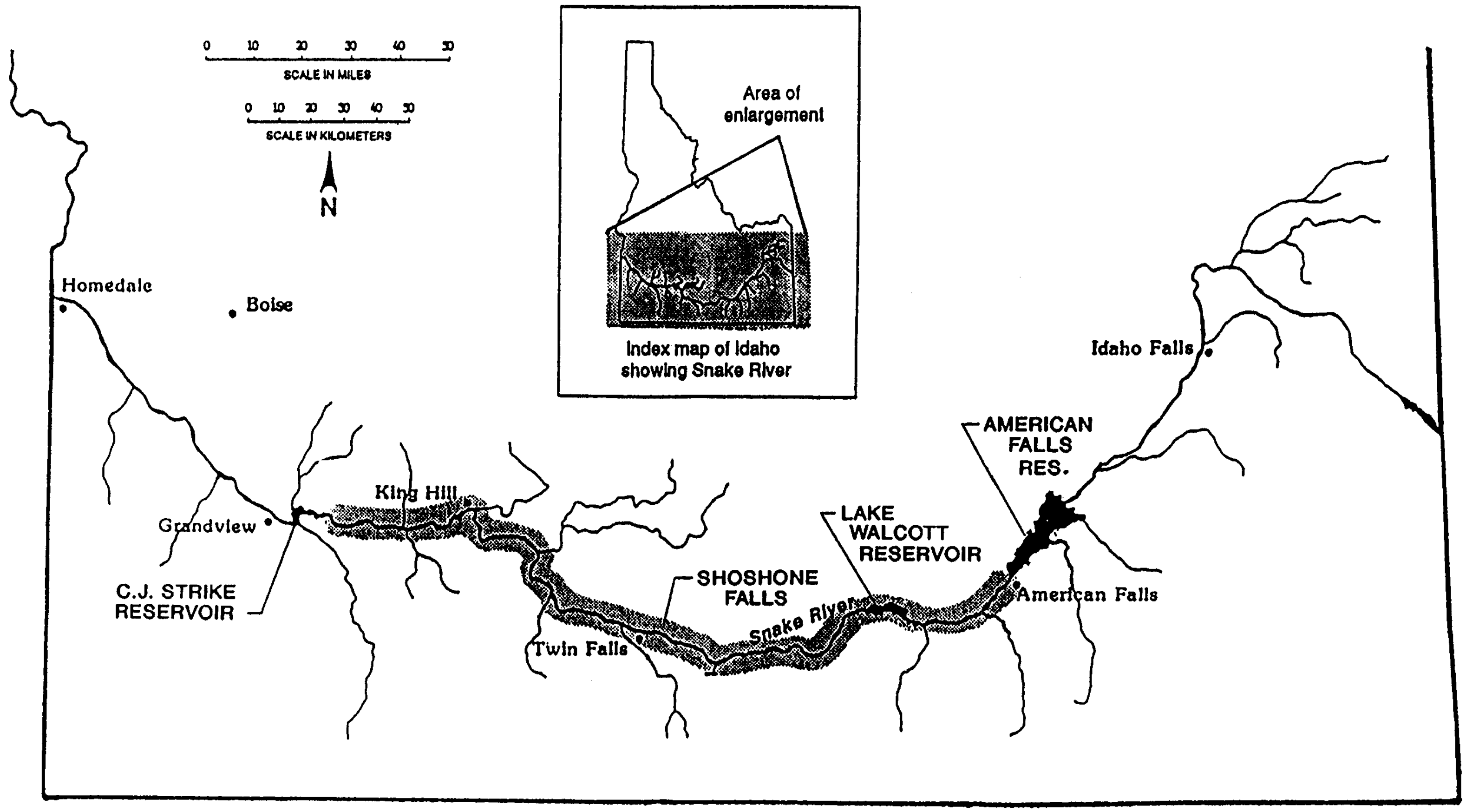

Figure 1 - SRM. Map of portions of the Snake River in Idaho; shading indicates recovery area for the Snake River Aquatic Species.

SECTION 7 GUIDELINES - Snake River Basin Office
Idaho Springsnail (endangered)
(*Pyrgulopsis idahoensis*)

Species Description

Using specimens collected by H.M. Tucker in 1930, near Homedale, Idaho, H.A. Pilsbry (1933) first described the Idaho springsnail as *Amnicola idahoensis*. In 1965, Gregg and Taylor revised the genus *Amnicola* into a new genus *Fontelicella*. Later Hershler and Thompson (1987) assigned *Fontelicella* to the genus *Pyrgulopsis*. The Idaho springsnail has a narrowly elongate shell reaching a height of 5 to 7 millimeters (mm) [0.2 to .25 inches (in)], with up to 6 whorls. In the Snake River, the species is distinguished from other Hydrobiids by its striking, yellow-gold pigmentation on soft body parts.

Life History and Habitat

This species is found only in permanent flowing waters of the mainstem Snake River; the snail is not found in any of the Snake River tributaries or in marginal cold-water springs (Taylor 1982d). The species is an interstitial (between or within spaces) dweller occurring on mud or sand in gravel-to-boulder size substrate. It generally avoids finer sediments for more structurally diverse and physically and temporally stable substrates. This species is believed to be algivorous, to reproduce sexually, and to lay cases with single eggs between May and June; a function believed to be linked to warming temperatures and photoperiod. Juvenile snails are <1 millimeter in length and transparent, although the yellow-gold pigments are clearly visible under a microscope. It is believed that this snail, in common with the other listed snail species, is short-lived and generally completes its life cycle in two years or less.

The springsnail is a Lake Idaho endemic, and in fossil form has the same potential relict range as the Bliss Rapids snail (Frest 1991a). Historically, the Idaho springsnail was found from Homedale (river kilometer [rkm] 670, river mile [rm] 416) to Bancroft Springs river mile (rkm 890) and has been collected at 10 locales (Figure 2 - SRM).

The species is discontinuously distributed in the mainstem Snake River at a few sites within C. J. Strike Reservoir (rkm 834, rm 518) upstream to Bancroft Springs (rkm 890, rm 553), a reduction of nearly 80% from its historic range (Figure 2). This species has declined in numbers and remaining populations are believed to be small and fragmented outside of C.J. Strike Reservoir.

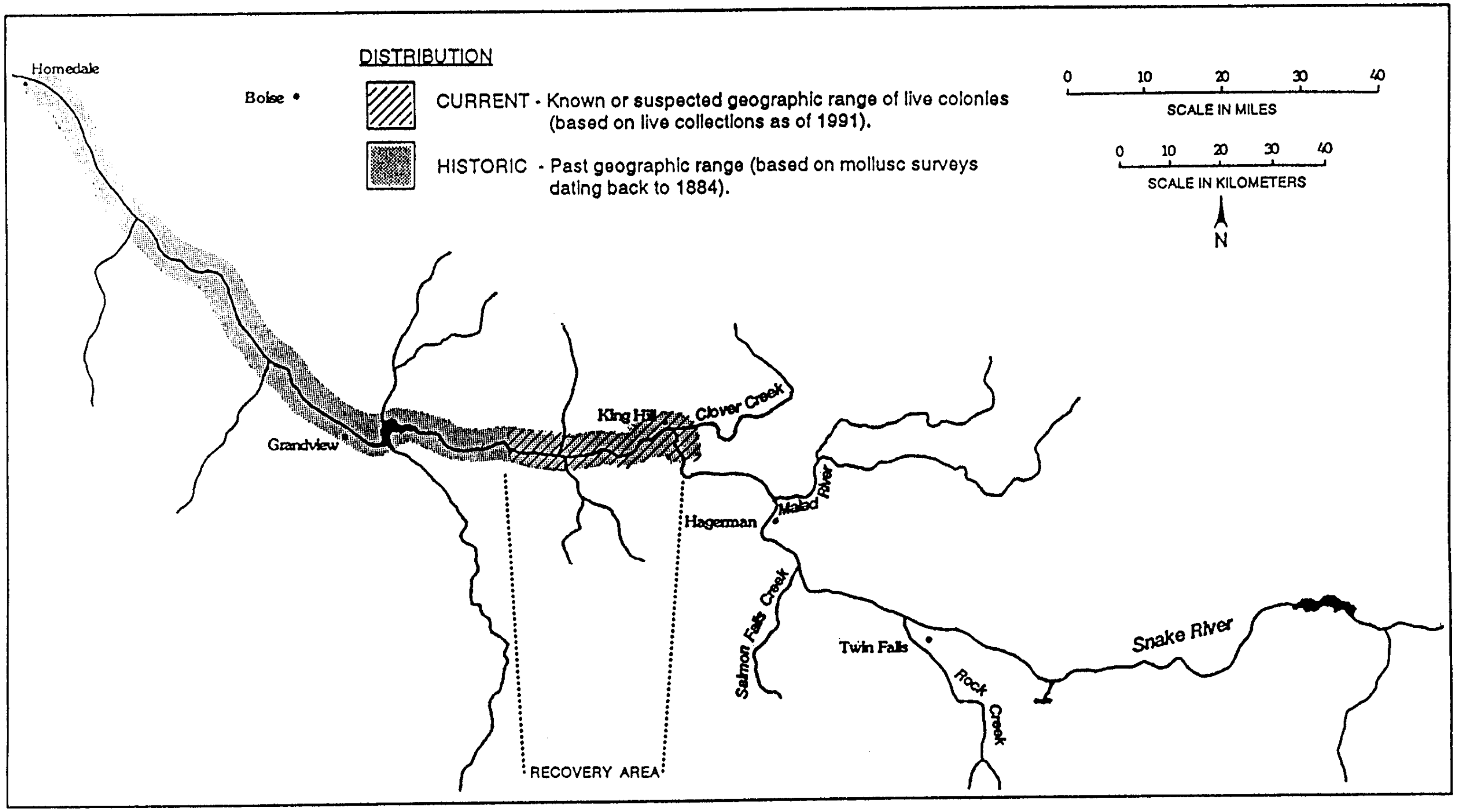

Figure 2 - SRM. Idaho springsnail (Pyrgulopsis idahoensis) current and historic distribution within the Snake River drainage in Idaho. The springsnail is currently discontinuously distributed only in the mainstem Snake River. The recovery area includes the aquatic ecosystem where suitable habitat is restored and self-reproducing colonies are established.

SECTION 7 GUIDELINES - Snake River Basin Office
Utah Valvata Snail (endangered)
(*Valvata utahensis*)

Species Description

Call (1884) first described this species as *Valvata sincera* var. *utahensis* from specimens collected at Utah Lake, Utah. Walker (1902) revised the genus and elevated *V. utahensis* to species level. The adult Utah valvata adult is 4.5 to 6.0 mm (0.2 in) in length, has a turbinate shell form (about equally high and wide) with up to 4 whorls, and is characterized by a single carina, or ridge, spiraling anteriorly from near the aperature margin to the protoconch, or apical whorl.

Life History and Habitat

In the Snake River, *V. utahensis* inhabits varied substrates including silt, sand, and sub-aquatic vegetation. The species is generally found in between two and eight meters of water in reservoir systems, but also in pools adjacent to rapids or in perennial flowing waters associated with large spring complexes. The species is not known to utilize areas with heavy currents or rapids. The snail is generally collected in well-oxygenated areas of limestone mud or mud-sand substrate among beds of submergent aquatic vegetation. In laboratory studies, however, the species utilized pebbles most frequently (1 - 2cm diameter particle size) and gravel, sand, and silt in descending order. It is generally absent from boulder size substrates in the Snake River. *Chara*, a rooted aquatic plant that concentrates both calcium carbonate and silicon dioxide, is a common associate of *V. utahensis. V. utahensis* is believed to be primarily a detritivore, grazing along the mud surface ingesting dead and decaying animal and plant debris. In habitats with boulders on mud, the snail has been observed grazing diatoms, periphyton (a polysaccharide matrix containing bacteria, algae, and protozoa), and possibly other aquatic plants.

Valvata utahensis occurred historically in Utah Lake in Utah, and in the Snake River of southern Idaho (Taylor 1987) (Figure 3). Its modern range extended as far downstream as Grandview (rkm 783, rm 487) (Taylor 1987). Recent mollusc surveys throughout Utah revealed no live snails, and the species is believed to be extirpated there (Clarke 1991).

At present, this species occurs in a few springs and mainstem Snake River sites in the Hagerman Valley and in Blue Lakes. Large populations exist in Lake Walcott Reservoir and in a few sites upstream below American Falls Dam downstream near the Eagle Rock site (Figure 3 - SRM). Past surveys at The Nature Conservancy Thousand Springs Preserve revealed declines in numbers and range of Utah valvata over a four-year period (Frest and Johannes 1992). In 1991, live colonies of this snail persisted in only two areas at the Preserve with a population estimate for each colony at or below 6000 individuals. Population density varied but averaged six live individuals counted per quarter meter^2 (2.69 ft^2) within each colony.

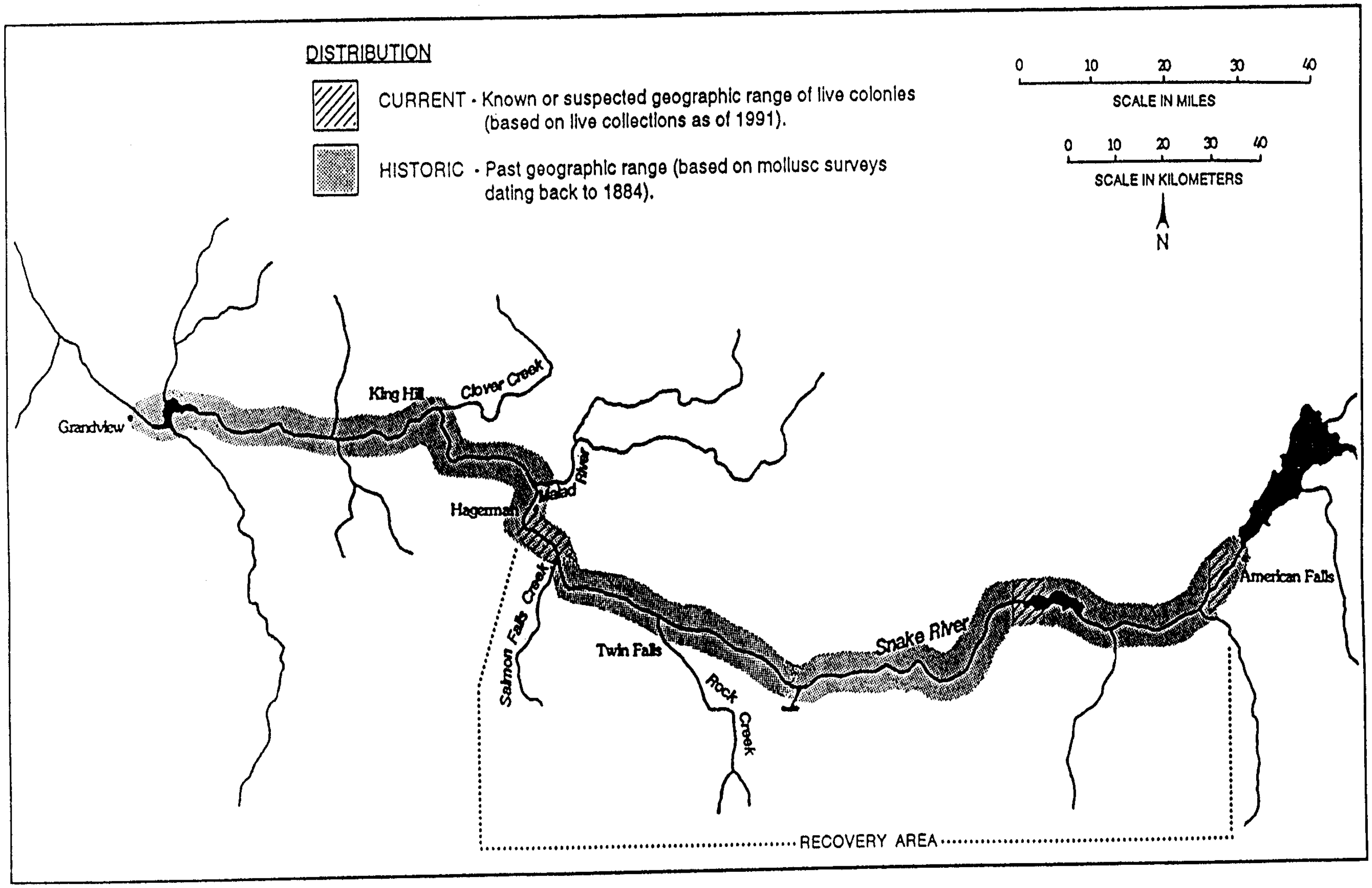

Figure 3 - SRM. Utah valvata (Valvata utahensis) current and historic distribution within the Snake River drainage in Idaho. The snail occurs in both the mainstem Snake River and adjacent cold-water springs. The recovery area includes the aquatic ecosystem where suitable habitat is restored and self-reproducing colonies are established.

SECTION 7 GUIDELINES - Snake River Basin Office
Snake River Physa Snail (endangered)
(*Physa natricina*)

Species Description

The Snake River physa snail was named *Physa natricina* and described by Taylor (1988). Fossil records of the species occur in deposits from Pleistocene-Holocene lakes and rivers from southeastern Idaho and northern Utah. The shells of adult Snake River physa snails are about 5 to 7 mm (0.2 to 0.25 in) high with 3 to 3.5 whorls and are amber to brown in color.

Life History and Habitat

The species occurs on the undersides of gravel-to-boulder size substrate in swift current in the mainstem Snake River. Living specimens have been found on boulders in the deepest accessible part of the river at the margins of rapids. Taylor (1982c) believed much of the habitat for this species was in deep water beyond the range of routine sampling.

Taylor (1988) cites collections of this species from 1956 through 1985 and considers its "recent" range in the Snake River to extend from Grandview rkm, rm (based on empty shells) upstream through the Hagerman Reach (rkm 917, rm 573) (Figure 4 - SRM). Taylor (1988) stated that the Grandview sub-population was extirpated in the early 1980s "... as the native bottom fauna has been virtually eliminated in this segment of the Snake River." The Snake River physa was also recorded below Minidoka Dam (rkm 1086, rm 675) in 1987 (Pentec 1991a). However, recent comprehensive snail surveys in southeastern Idaho and northern Utah (Frest et al. 1991) and in a free-flowing reach near Buhl (Frest and Johannes 1992) failed to find live specimens. At present, two populations (or colonies) are believed to remain in the Hagerman and King Hill reaches, with possibly a third colony immediately downstream of Minidoka Dam (Figure 4). Live Snake River physa snails are always rare at collection sites; it is believed that fewer than 50 live Snake River physa have been collected in the Snake River (Frest et al. 1991).

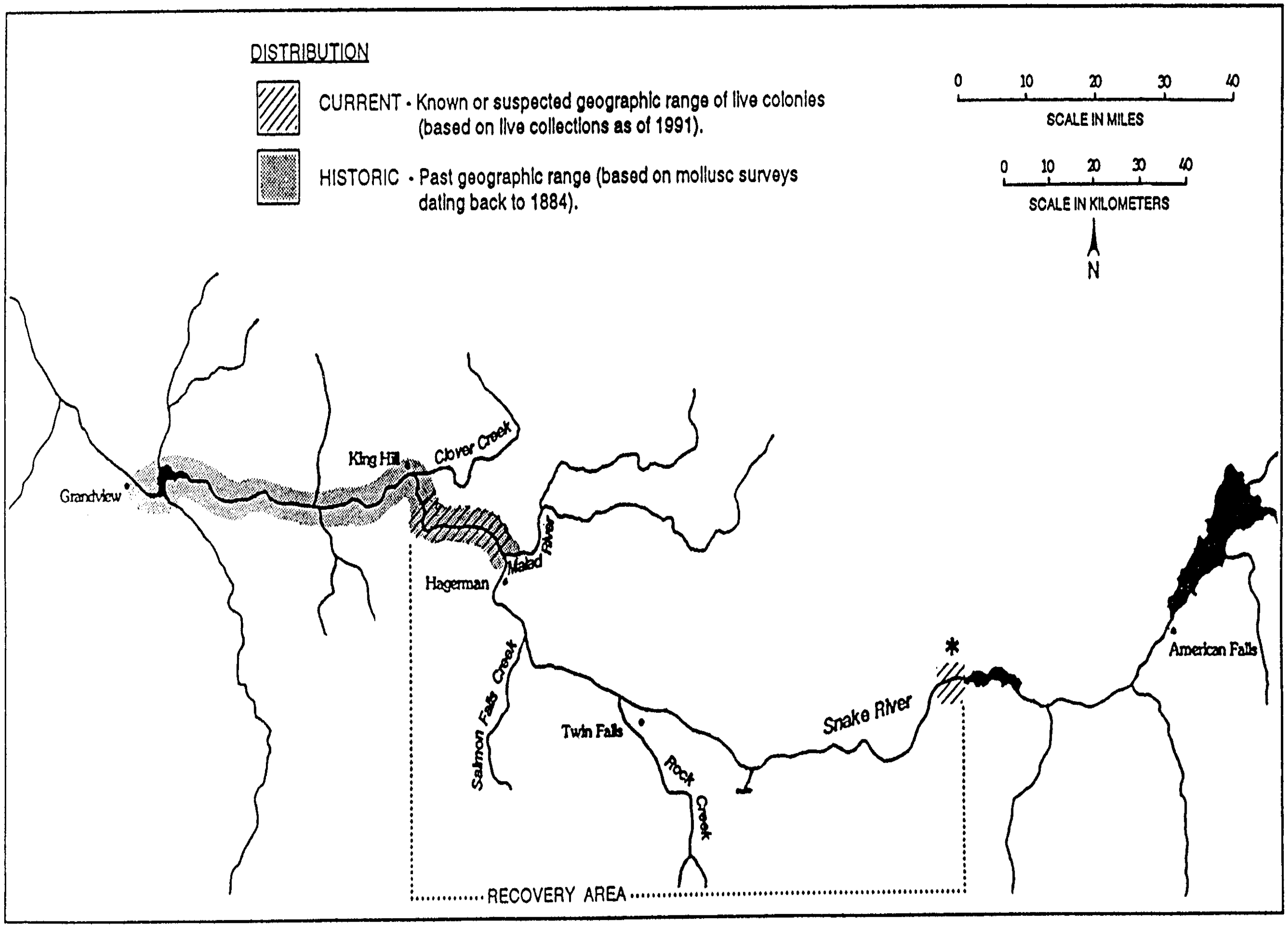

Figure 4 - SRM. Snake River physa (Physa natricina) current and historic distribution within the Snake River drainage in Idaho. The physa is currently discontinuously distributed only in the mainstem SnakeRiver. The recovery area includes the aquatic ecosystem where suitable habitat is restored and self-reproducing colonies are established
* Recorded live below Minidoka Dam in 1987.

SECTION 7 GUIDELINES - Snake River Basin Office
Bliss Rapdis snail (threatened)
(*Taylorconcha serpenticola*)

Species Description

The Bliss Rapids snail (*Taylorconcha serpenticola*) was formally described by Hershler et al. (1994). It was first collected live and recognized as a new taxon in 1959 (Taylor 1982a).
The Bliss Rapids snail is 2.0 to 2.5 mm (0.1 in) in height, with three whorls, and is roughly ovoid in shape. There can be two color variants in the Bliss Rapids snail, the colorless or "pale" form and the orange-red or "orange" form. The pale form is slightly smaller with rounded whorls and with more melanin pigment on the body (Frest and Johannes 1992).

Life History and Habitat

This snail occurs on stable cobble-boulder size substrate in flowing waters of unimpounded reaches of the mainstem Snake River and in a few spring habitats in the Hagerman Valley. The species does not burrow in sediments and normally avoids surfaces with attached plants. Known river populations (or colonies) of the Bliss Rapids snail occur only in areas associated with spring influences or rapids-edge environments and tend to flank shorelines. They are found at varying depths wherever dissolved oxygen and temperature requirements persist and are found in shallow (< 1 centimeter (cm)(0.5 in), permanent, cold springs (Frest and Johannes 1992). The species is considered moderately negatively phototaxic and resides on the lateral sides and undersides of rocks during daylight (Bowler 1990). The species can be locally quite abundant, especially on smooth rock surfaces with crusting red algae.

The Bliss Rapids snail was known historically from the mainstem middle Snake River and associated springs between Indian Cove Bridge (rkm 846, rm 525) and Twin Falls (rkm 982.9, rm 610.5) (Hershler 1994) (Figure 5 - SRM). Taylor (1982b) wrote that "...prior to dam construction there was probably a single population throughout this range, and plausibly upstream as well." Localities of present surviving subpopulations have been reported by Taylor (1987) and Frest (1991a). Pentec (1991b) likely extended the present, known range of the species upstream approximately 259.2 km (162 mi) when it was found in spring habitats above American Falls Reservoir (rkm 1207.1, rm 749.8). This highly disjunct upstream record requires further verification (Hershler et al. 1994). Based on live collections, the species currently exists as discontinuous populations within its historic range (Figure 5 - SRM). These colonies are primarily concentrated in the Hagerman reach, in tailwaters of Bliss and Lower Salmon Falls Dams and several unpolluted springs including Thousand Springs, Banbury Springs, Box Canyon Springs and Niagara Springs (Figure 6 - SRM).

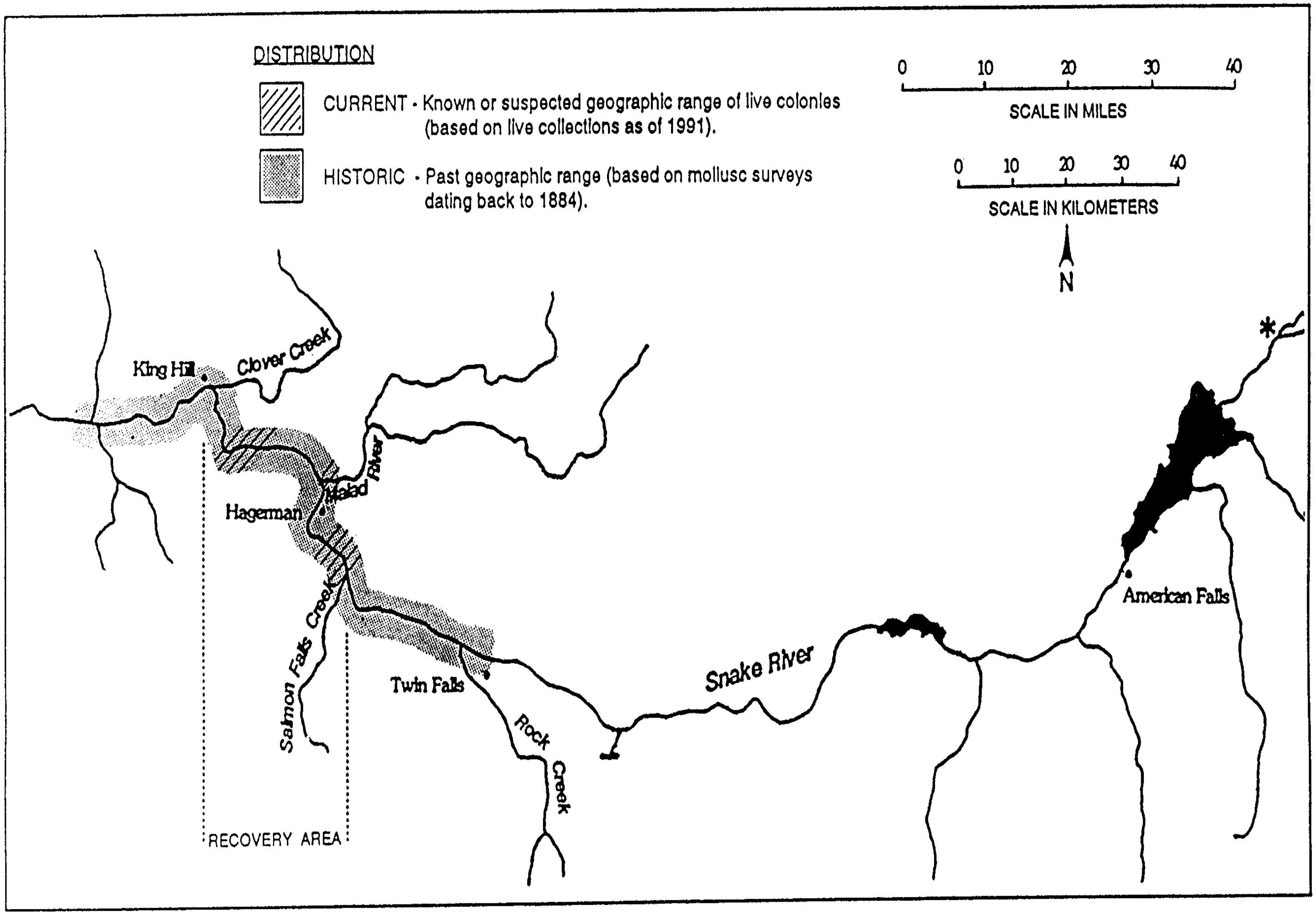

Figure 5 - SRM. Bliss Rapids snail (Taylorconcha serpenticola) current and historic distribution as well as proposed recovery area within the Snake River drainage in Idaho. The snail occurs in both the mainstem Snake River and adjacent cold-water springs. The recovery area includes the aquatic ecosystem where suitable habitat is restored and self-reproducing colonies are established.
*Denotes the occurrence of a disjunct population near the confluence with the Blackfoot River.

SECTION 7 GUIDELINES - Snake River Basin Office
Banbury Springs Lanx (endangered)
(Undescribed *Lanx* species)

Species Description

This snail is a member of Lancidae, a small family of pulmonates (snails that possess lung-like organs) endemic to western North America. The species was first discovered in 1988 (Frest *in lit.* 1991b) and has not been formally described. It is distinguished by a cap-shaped shell of uniform red-cinnamon color with a subcentral apex, with a length and height that exceeds its width.

Life History and Habitat

The species has been found only in spring-run habitats with well-oxygenated, clear, cold [15 to 16^{o}C (59 to 60.8^{o}F)] waters on boulder or cobble-size substrate. All known locations have relatively swift currents. They are found most often on smooth basalt and avoid surfaces with large aquatic macrophytes or filamentous green algae. Beak (1989) reported the species, originally identified as *Fisherola nuttalli*, at depths ranging from 30 to 75 cm (12 to 30 in) on boulder substrate. Frest and Johannes (1992) found the species in water as shallow as 5 cm (2 in), but depths up to 15 cm (6 in) were more typical. All lancids are particularly affected by dissolved oxygen fluctuations since respiration is accomplished only through the mantle; lungs, gills, and other specialized respiratory structures are lacking (Frest and Johannes 1992). Common mollusc associates of this species include the threatened Bliss Rapids snail and vagrant pebblesnail (*Fluminicola hindsi*).

At present, the Banbury Springs lanx is known to occur only in the largest, least disturbed spring habitats at Banbury Springs, Box Canyon Springs, and Thousand Springs. This lanx was first discovered in 1988 at Banbury Springs (rkm 949, rm 589) with a second colony found in nearby Box Canyon Springs (rkm 947, rm 588) in 1989. During 1991, a mollusc survey at TNC's Preserve revealed a third colony in the outflows of Thousand Springs (rkm 941, rm 584.6) (Pentec 1991b) (Figure 6 - SRM). Subsequent to this discovery, a more detailed investigation at the Preserve revealed that the single colony was sporadically distributed within an area of only 12 to 14 square meters (m^2) [129 to 150.7 square feet (ft^2)] (Frest and Johannes 1992). Population density ranged from 4 to 20 individuals/m^2. The total adult population at the Preserve was estimated at between 600 to 1200. All three known colonies of lanx were discovered in alcove spring complexes. These spring complexes contain large areas of adjacent, presumably similar, habitat that is not occupied by the species.

Reasons for Decline and Threats to the Five Species

The free-flowing, cold-water environments required by the listed Snake River species have been affected by, and are vulnerable to, continued adverse habitat modification and deteriorating water quality from one or more of the following: hydroelectric development, load-following (the practice of artificially raising and lowering river levels to meet short-term electrical needs at local run-of-the-river hydroelectric projects), water pollution, inadequate regulatory mechanisms which have failed to provide protection to the habitat used by the listed species, and possible adverse affects from exotic species.

Seven proposed hydroelectric projects (Figure 7 - SRM), including two high-dam facilities, potentially threaten remaining free-flowing river reaches between C.J. Strike and American Falls Dam. Dam construction adversely affects aquatic species through direct habitat modification and impairment of the ability of the Snake River to assimilate point and nonpoint source pollution. Further hydroelectric development along the Snake River would inundate existing snail habitats through impoundment; reduce critical shallow shoreline habitats in tailwater areas due to stage level fluctuations; elevate water temperatures; reduce dissolved oxygen levels in impounded reaches; and further fragment remaining mainstem populations or colonies of the listed snails. Load-following threatens native aquatic species habitat when fluctuating flows through a powerhouse dewater aquatic habitats in shallow shoreline areas. With the exception of the Banbury Springs lanx and possibly the Snake River physa, these daily water fluctuations prevent snail species from occupying potentially favorable habitats.

The quality of water in these habitats has a direct effect on the survival of native aquatic species. Water temperature, dissolved oxygen concentrations, and turbidity are all critical components of water quality that affect the survival of the 5 listed aquatic snails. These species require cool, clean, and well-oxygenated waters. They are relatively less tolerant of pollution and factors that cause oxygen depletion, siltation, or elevated water temperatures.

Recovery of the listed species will depend on restoration of their habitat, and will entail restoration of the water quality of the middle Snake River to a level that supports and maintains less tolerant, indicator species, and promotes a healthy, diverse, and sustainable aquatic ecosystem. In particular, reduction of nutrient and sediment loading to the river and restoration of riverine conditions are believed to be needed to recover the listed species.

Any factor that leads to further deterioration in water quality would likely extirpate these taxa. For example, the Banbury Springs lanx lacks lungs or gills and respires through unusually heavy, vascularized mantles. This species cannot withstand even temporary episodes of poor water quality conditions. Because of their stringent oxygen requirements, any factor that reduces dissolved oxygen concentrations for even a few days would very likely prove fatal to most or all of individuals in the affected area.

Factors that further degrade water quality include reduced stream flow as a result of water withdrawals for agriculture, warming due to impoundment, and increases in the concentration of nutrients, sediments, and other pollutants reaching the river. The Snake River is affected by runoff from feedlots and dairies, hatcheries, municipal sewage effluent sources, and other point and nonpoint discharges. During the irrigation season more than 50 agricultural surface drains contribute irrigation return water to the Snake River (Idaho Department of Health and Welfare (IDHW) 1991). In addition, commercial, state, and Federal fish culture facilities discharge wastewater into the Snake River and its tributaries. These factors coupled with periodic, drought-induced low flows, have contributed to reduced dissolved oxygen levels and increased plant growth and a general decline of cold-water, free-flowing river habitats in the Snake River.

Water quality in the alcove springs and tributary spring streams in the Hagerman Valley area have also been affected, though not as severely as the mainstem Snake River. The unique hydrogeology of the Hagerman area provides conditions for massive cold-water recharge from the Snake River Plain aquifer. However, several of these springs and spring tributaries have been diverted for hatchery use, which reduces or eliminates clean water recharge and contributes flows enriched with nutrients to the Snake River. At TNC's Preserve, colonies of Utah valvata and Bliss Rapids snail have recently declined or been eliminated at several sites. This decline is due to decreases in water quality primarily from agriculture and aquaculture wastewater originating outside of and flowing into the Preserve (Frest and Johannes 1992).

Another threat to the listed species is the competition with the New Zealand mudsnail (*Potamopyrgus antipodarum*) in the middle Snake River. The widely distributed and adaptable mudsnail is experiencing explosive growth in the Snake River and shows a wide range of tolerance for fluctuations in water level, velocity, temperature, and turbidity. Based on recent surveys, the mudsnail is not abundant in habitats utilized by the Banbury Springs lanx or the Utah valvata. However, the species does compete directly for resources with the Snake River physa, the Bliss Rapids snail, and Idaho springsnail in the mainstem Snake River.

The Snake River Aquatic Species Recovery Plan, completed in December l995, contains an extensive bibliography on the listed snails in addition to other aquatic species. Copies of the Plan may be obtained from the U.S. Fish and Wildlife Service, l387 South Vinnell Way, Room 368, Boise, Idaho 83709.

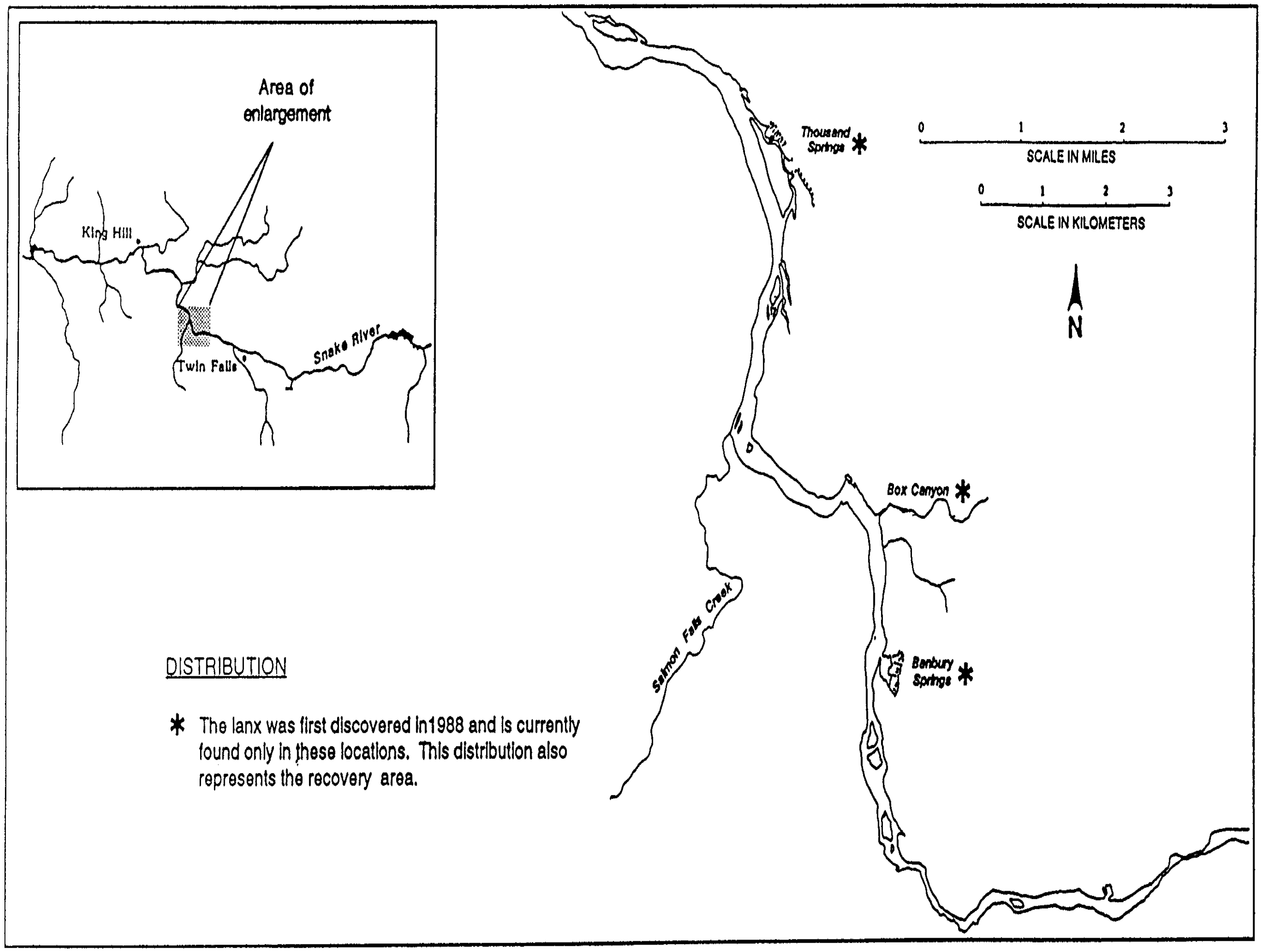

Figure 6 - SRM. Banbury Springs lanx (Lanx sp.) current distribution within the Snake River drainage in Idaho. The lanx occurs only in these three cold-water spring complexes, and is not found in the mainstem Snake River.

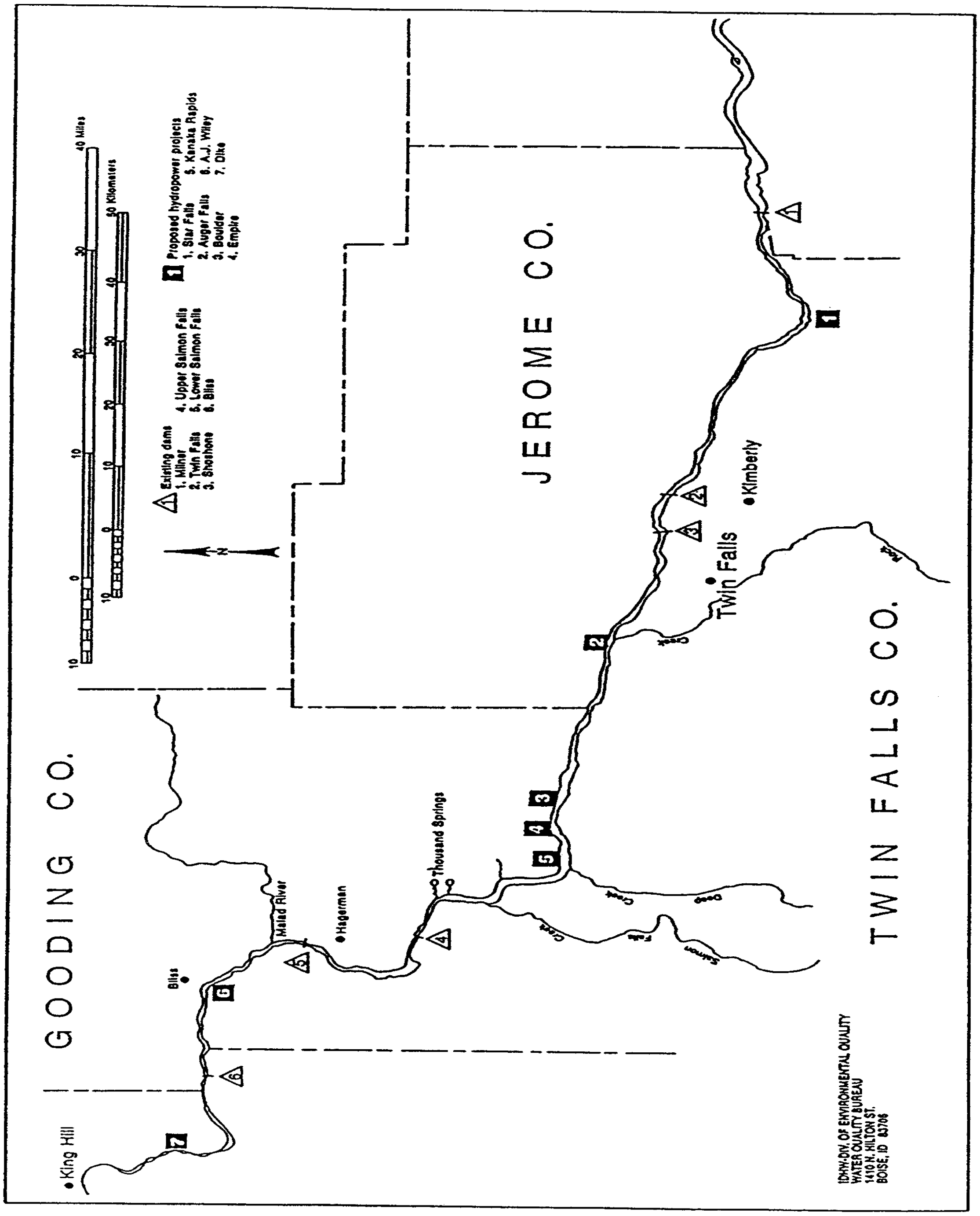

Figure 7 – SRM. Map of existing and proposed hydropower projects on the middle Snake River in Idaho.

References

U. S. Fish & Wildlife Service, l995. Snake River Aquatic Species Recovery Plan. Snake River Basin Office, Ecological Services, Boise, Idaho. 92 pp.

U. S. Fish & Wildlife Service. 1992(December 14, 1992). Endangered and Threatened Wildlife and Plants; Determination of endangered or threatened status for five aquatic snails in South Central Idaho. Volume 57. Number 240, pp. 59244-59256.

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II. GUIDELINES - Protocol for Evaluating Project Effects

The discussion applies to the riverine habitats and tributary springs along the Snake River within the area from C. J. Strike to the city of Idaho Falls. As noted in the Recovery Plan, the snail recovery area is from C.J. Strike Dam to American Falls Dam. This is, however, only a portion of the historic range of the snails. The evaluation area is larger than the recovery area because there is the potential for snails to be present in the Snake River between American Falls Reservoir and Idaho Falls.

First, obtain existing information of previous mollusk surveys at the site. The USFWS can supply a list of species that may be present at the site. Obtain the survey data that documents the species present at the site. If no mollusk surveys have been conducted, sites near perennial cold-water springs or instream Snake River habitats, could contain listed mollusks. In general, if the proposed project is within or adjacent to these aquatic habitats, it should be evaluated for its impact on listed mollusk species. Activities that could adversely impact the mollusks include, but are not limited to, effluent from fish hatcheries, hydroelectric power projects, water withdrawal projects, dredging of river substrates, livestock grazing or other agricultural practices that may contribute to non-point sources of pollution to aquatic habitats.

The physical and chemical features of the aquatic habitat should include but are not limited to: water temperature, dissolved oxygen, PH, turbidity. Aquatic microhabitat characteristics the site such as water depth, substrate, water velocity, distance from shore, distance from bankfull height should be obtained.

Research in the above listed areas includes investigations into those activities that involve <u>direct</u> impacts to mollusks or mollusk habitat should be evaluated in the form of a Biological Assessment. For instance, scuba diving with video camera equipment would not be considered research. Benthic macro invertebrate surveys would be included as actions that may adversely impact listed mollusks. Collection of water quality or flow data that require the investigator to be in the water, potentially impacting snail habitat, should also be evaluated in a Biological Assessment. These actions also have the potential to take listed mollusks and the appropriate permits should be obtained for the U. S. Fish and Wildlife Service to comply with the Endangered Species Act of 1973, as amended.

<u>Recovery Objectives and Criteria</u>

The short term objective of the Recovery Plan is to protect known live colonies of the federally listed snails by eliminating or reducing known threats. The long term objective is to restore viable, self-reproducing colonies of the 5 listed snails within specific geographic ranges to the point that they are delisted (see Figure 1).

<u>Actions Needed to Initiate Recovery</u>

1. Provide suitable water quality and habitat conditions in the Snake River so that viable,

self-reproducing snail colonies are established in "suitable" flowing mainstem and cold-water spring habitats within the following geographic ranges:

Idaho springsnail

The area of recovery (see Figure 2) is the mainstem Snake River between river kilometer (rkm) 834 and 890 (rm 518 and 553). Suitable habitats include mud or sand associated with gravel-to-boulder size substrate.

Utah valvata snail

The area of recovery (see Figure 3) is the mainstem Snake River and tributary cold-water spring complexes such as Box Canyon and Thousand Springs between rkm 932 and 1142 (rm 579 to 709).
Suitable habitats include well-oxygenated mud or sand substrates.

Snake River physa

The area of recovery (see Figure 4) is the mainstem Snake River between rkm 890 and 1086 (rm 553 and 675). Suitable habitats include rock and boulder substrate in deep water at the margin of rapids.

Bliss Rapids snail

The area of recovery (see Figure 5) is the unimpounded mainstem Snake River and tributary cold-water spring complexes (ie., Banbury, Niagra, Box Canyon and Thousand Springs) between rkm 880 and 942 (rm 547 and 585). Suitable habitats include cobble-boulder substrates.

Banbury Springs Lanx:

The areas of recovery (see Figure 6) are cold-water spring complexes tributary to the Snake River (i.e., Box Canyon, Banbury, and Thousand Springs) between rkm 941.5 and 948.8 (rm 584.8 and 589.3). Suitable habitats include well oxygenated, clear, cold (15-16 C) water on boulder or cobble substrates.

2. Establish year-round minimum flows in the mainstem Snake River below Milner Dam suitable for permanent snail recolonization within each species' recovery areas.

3. Develop and implement habitat management plans that include conservation measures to protect all cold-water spring habitats occupied by Banbury Springs lanx, Bliss Rapids snail, and Utah valvata snail from further habitat degradation due to diversions, pollution and development (as described in Action #1).

4. Stabilize the Snake River Plain aquifer to protect discharge in the listed species spring habitats.

5. Evaluate the effects of non-native flora and fauna on listed species in the Snake River from C. J. Strike Dam upstream to American Falls Dam.